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安徽潜山古新世混兽目(哺乳纲)一新属[1)]

王 元 青
(中国科学院古脊椎动物与古人类研究所,北京 100044)

摘要 产于潜山盆地中古新统望虎墩组上段的混兽目(Mixotheridia)的新属种——周氏安徽兽(*Wania chowi* gen. et sp. nov.),主要特征是:齿式?·1·3(?)·2+?/?·1·3·3,上颊齿外架窄,外中凹浅,附尖不发育,P^5后尖明显,臼齿向后显著变小,P_5及M_3下跟座均具两个小尖。与该目中两个科 Zhelestidae、Zalambdalestidae 的成员相比,*Wania* 在牙齿结构上更接近于 Zhelestidae 的成员,而且它不具有 Zalambdalestidae 科的典型特征,本文暂将它归入 Zhelestidae 科中。

关键词 安徽潜山,古新世,混兽目

一、前 言

在京九铁路支线合(肥)九(江)线潜山段的施工过程中,中国科学院古脊椎动物与古人类研究所安徽潜山课题组于1993年先后4次到安徽潜山进行野外工作,采集到一批保存较好的哺乳动物化石。加上近几年发现的材料,使安徽潜山古新世哺乳动物化石材料在数量和质量上都有了很大提高。这些化石材料中,仅有少数类群的材料,如狉兽科、钝脚目,被描述报道(胡耀明,1993;王元青,1993;王元青等,1992)。本文记述的材料是在1993年7月的野外工作[2)]中发现的,为同一个体的左侧上颌骨两段及一对下颌骨。

化石描述过程中,有关牙齿结构术语的中文译名主要采用周明镇等(1975)的译名。为了比较讨论中的方便,文中采用了五枚前臼齿的非传统描述方法,与传统的四枚前臼齿描述方法相比,前者的五枚前臼齿中的P1和P2与后者四枚前臼齿中的P1和P2相对应,而前者的P4和P5则分别相当于后者的P3和P4,四枚前臼齿的齿式结构是五枚前臼齿的齿式中的P3退化消失演化而成的(参见 McKenna, 1975 和 Novacek, 1986b)。牙齿测量是按照 Novacek (1976) 的方法在 Wild M7A 显微镜下完成的。

二、标 本 记 述

真兽次纲 Infraclass Eutheria Gill, 1872
混兽目 Mixotheridia Nessov, 1985
科 Zhelestidae Nessov, 1985
安徽兽属(新属) *Wania* gen. nov.

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2) 参加这次野外工作的,除作者外还有王原、杜文华(中国科学院古脊椎动物与古人类研究所)、余本爱、汪宗武、李丁生、徐礼智、余树华(安徽省潜山县文物管理所)等。

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属型种 周氏安徽兽(新属、新种) (*Wania chowi* gen. et sp. nov.)

特征 见属型种。

名称来源 属名取自化石产地潜山县所属安徽省之简称——皖 (Wan)。

分布 安徽潜山，中古新世。

周氏安徽兽(新属、新种) *Wania chowi* gen. et sp. nov.

(图 1—2；图版 I)

正型标本 属于同一个体的两件左上颌骨残段(分别具犬齿、P^2 齿槽和 P^4 前齿根齿槽以及 P^5-M^2) 和下颌骨一对(分别具左 P_5-M_3、P_4 齿槽、左犬齿和 P_2 齿根以及右 M_{2-3} 和 P_4-M_1 齿槽)。中国科学院古脊椎动物与古人类研究所标本编号：V12040。

产地层位 安徽省潜山县古井乡黄老屋南 150 米(70023)(见邱占祥等，1977)，中古新统望虎墩组上段。

特征 齿式?·1·3(?)·2+?/?·1·3·3，犬齿大，P^2 单根，P^5-M^2 横宽，外架窄，P^5 具小而明显的后尖，上臼齿前、后尖分开，外中凹浅，前、后尖棱不发育。M^2 小于 M^1，且后附尖部分退化。P_2 小，单齿根，P_5 臼齿化程度较高，具发育的三角座和双尖的跟座；下臼齿三角座比跟座高得多，M_{1-3} 逐渐变小；M_3 强烈退化，具不伸长的双尖跟座。

名称来源 种名以我国著名古脊椎动物学家、中国古新世哺乳动物研究第一人周明镇先生的姓氏命名。

描述 从保存的上、下颌骨判断，其个体小。下颌骨相对粗壮，下颌联合未愈合，伸达 P_2 和 P_4 的结合部，水平支下缘呈弧形，每侧下颌均只保存了一个颏孔，位于 P_4 之下，上升支仅在左下颌骨上有不完整保存，冠状突、角突及关节突均破损。上升支前缘向后倾斜，具强大的前缘脊，伸达 M_2 下方。上升支外侧为一深窝，是颧颌肌(同时可能也是深层咬肌和浅层颞肌)的附着处 (参考 Coldiron (1977) 关于 *Petrodromus tetradactylus* 下颌肌肉的描述)。上升支内面未见有下颌孔保存，考虑到上升支的发育状况，推测该孔位置低而靠后。中凸缘 (medial flange, Kielan-Jaworowska (1981) 术语)弱，自水平支上缘后端向后延伸。

左、右下颌骨的前端均破损，左下颌骨犬齿之前及右下颌骨 P_4 前齿槽之前断失。左 P_4-M_3 及右 M_{2-3} 保存较好。根据左下颌骨上保存的牙齿、齿根、齿槽判断，其下齿列应为 ?·1·3·3。

左下颌骨前端保存了两颗单根齿的齿根，前面一颗较大的齿根应属犬齿，而后面一颗很小的齿根则属 P_2。门齿未保存，由于已知早期哺乳动物均有门齿发育，考虑到下颌骨前端、下颌联合和犬齿的保存状况，可以认为它的门齿是很小的。从保存的犬齿齿根判断，下犬齿大，断面椭圆形。犬齿与 P_2 之间有一短的齿隙，约 0.68mm 长。P_2 齿根之后为一长约 0.78mm 的齿隙。其后有两个代表 P_4 的齿槽，表明 P_4 大小与 P_5 相近。在所有保存的后部颊齿上，下三角座均显著地高于下跟座，下三角座的后壁直立。

P_5 臼齿化程度较高，下三角座很发育，下原尖是下三角座上最大、最高的尖，尖端破损，估计比臼齿的下原尖还要高；下前尖最小、最低，位于牙齿前部舌侧，与几乎连生的下原尖、下后尖分得很开；下三角座张开，下前棱与下原棱之间的夹角约为 60°。下跟座小，

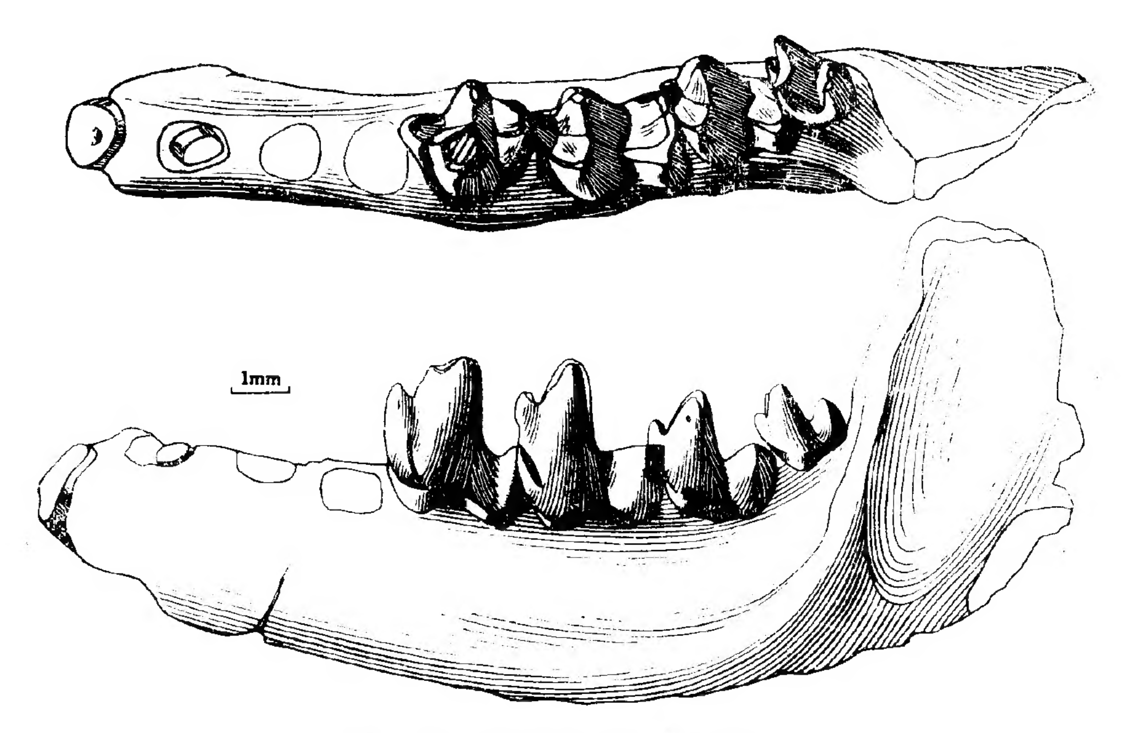


图 1 周氏安徽兽(新属、新种)左下颌骨

Fig. 1 Left lower jaw of *Wania chowi* gen et sp. nov.

上: 冠面视 (above: crown view); 下: 颊侧视 (below: buccal view)

具两个孪生的小尖,构成一个向舌侧倾斜的跟盆。下前齿带向舌侧方向抬升,延续到下前尖外侧。

M_1 是三个臼齿中最大的,与 P_5 相比,下三角座前后向更为压缩,但仍比较张开,下前棱与下原棱之间的夹角约为 45°; 下后尖与下原尖近等大;下前尖依然很小,下前尖和下后尖与下原尖之间被下前棱和下原棱上的切迹分开。下跟座呈向舌侧倾斜的张开的盆形,下次尖相对较大,下次小尖和下内尖很小,这三个尖之间没有明显的切迹。斜脊低,伸至下三角座后基部近齿中线稍靠颊侧的位置。下次尖位置靠后,与下内尖几乎在同一条横线上,下次小尖位于这条连线稍后的位置上。下内尖位于下跟座的后内角,无下内尖棱。下前齿带强壮,限于下原尖之前。

M_2 与 M_1 在冠面结构上相同,比 M_1 小,下跟座比下三角座窄。

M_3 退化,很小,下前棱不发育,下三角座向前开口,下跟座比下三角座短,不呈盆形,仅具两个孪生小尖,无斜脊。牙齿的测量数据见表 1 。

上颌骨前段保存了大而长的犬齿,犬齿舌侧距上腭中线约 2.50mm。紧靠犬齿后侧为一小的齿槽,从下牙的齿式来推断,很可能属于单根的 P^2。该齿槽之后,可见一较大的齿槽,应代表 P^4 的前齿根。

上颊齿仅保存了 P^5-M^2,相邻的颊齿间有明显的斗隙。P^5 三齿根,次臼齿化,横宽,前尖大,高于颊齿的所有其他齿尖,位于牙齿的颊侧中部;后尖小而明显,位于牙齿的后外

侧角上，高度约为前尖的 1/3，与前尖之间有一切迹分开；原尖很发育。前外架 (parastylar shelf) 相对发育，具弱的前附尖，后外架 (metastylar shelf) 近于消失。前尖棱弱，不与前附尖相连，无后尖棱。前小尖很弱，位于牙齿前边缘近中线的位置上，前小尖前棱与前附尖相连，无前小尖后棱。无后小尖。原尖前棱短，止于前小尖内侧，原尖后棱直接伸到牙齿的后外角。外齿带长，从牙齿的前外角延伸至后外角；后齿带短，仅位于原尖后侧；无内齿带及前齿带。

表 1　周氏安徽兽(新属、新种)上、下齿列的测量数据(单位：毫米)

Table 1　The measurements of the upper and lower dentitions of *Wania chowi* gen. et sp. nov. (in mm)

	C^1	P^4	M^1	M^2	C_1	P_2	P_4	M_1	M_2		M_3	
	左 (L)	左 (L)	左 (L)	左 (L)	左 (L)	左 (L)	左 (L)	左 (L)	左 (L)	右 (R)	左 (L)	右 (R)
长 (Length)	1.96	2.59	2.43	1.78	1.78	1.13	2.92	3.08	2.43	2.43	1.78	1.78
宽 (Width)	1.56	4.05	4.54	3.89	1.37	0.73	2.11	1.94	1.78	1.94	1.38	1.30
								1.86	1.60	1.78	0.97	0.97

齿宽栏上行为下三角座宽，下行为下跟座宽。

M^1 是保存的三枚颊齿中最大的，横宽，前尖比后尖高大，两者仅在基部相连，无前、后尖棱，外架窄，外中凹浅，前外架与后外架上无明显的附尖和其他小尖，原尖V形，比前尖、后尖略低，原尖前棱和后棱分别与不太发育的前、后小尖相连，前小尖前棱和后小尖后棱

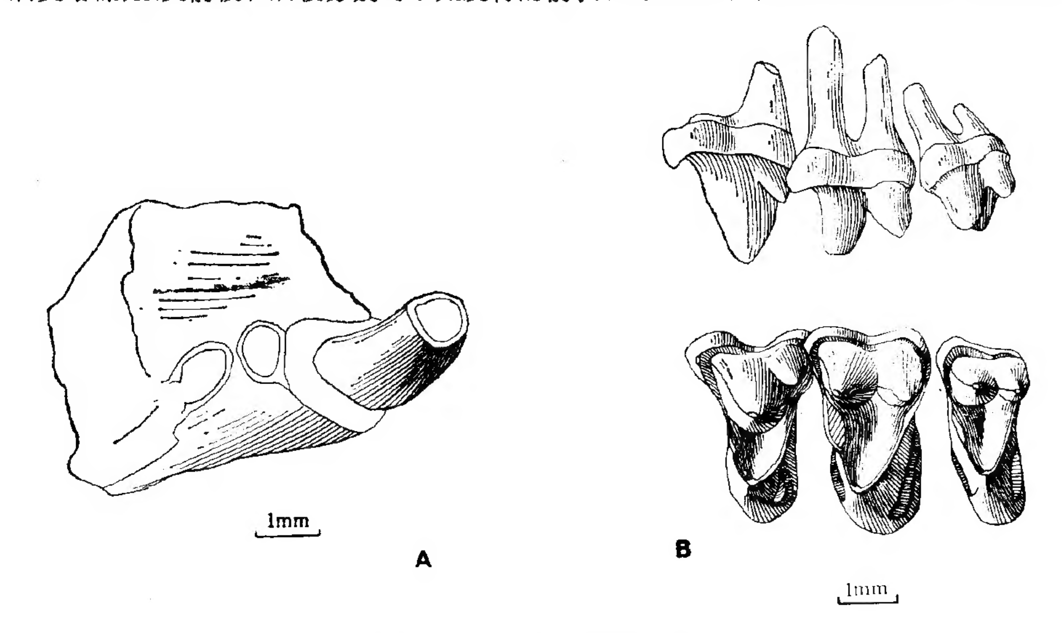


图 2　周氏安徽兽(新属、新种)

Fig. 2　*Wania chowi* gen. et sp. nov.

A. 左上颌骨前段腭面视 (ventral view of anterior fragments of left upper jaw)
B. 左 P^5-M^2 (left P^5-M^2)，上：颊侧视 (above: buccal view)；下：冠面视 (below: crown view)

伸达牙齿的前外角和后外角，与外齿带相连，前齿带窄，位于牙齿前缘舌侧，后齿带比前齿带宽，似一次尖架。

M^2比M^1小，冠面结构与M^1相似，外架窄，后外架退化，前小尖小而明显，后小尖几乎不可见，后小尖后棱不伸达后外角，前、后齿带均比M^1的弱。

标本上未保存M^3，从保存的下齿列来看，M^3即使存在，也非常小。

在所有保存的上颊齿中，原尖的舌侧壁均向颊侧倾斜，原尖后棱均低于前棱。

比较讨论[1)] 潜山发现的新材料具有一系列真兽类的原始特征，可以与早期原始的真兽类比较，这些特征包括：上颊齿横宽，小尖弱，下前尖小，下三角座与下跟座高差大等。在原始的真兽类中，可以与新材料比较的主要有 Otlestidae Nessov, 1985、*Kennalestes* Kielan-Jaworowska, 1968、Palaeoryctidae Simpson, 1931、Zalambdalestidae Gregory and Simpson, 1926、Zhelestidae Nessov, 1985 和 Leptictidae Mckenna, 1975。

Prokennalestes Kielan-Jaworowska and Dashzeveg, 1989 是最原始的真兽类哺乳动物之一，被归入 Otlestidae 科中。它的上颊齿外架宽，原尖部分窄，附尖发育，外中凹深，无前、后齿带，具5个前臼齿，P^5无明显的后尖，M^2是上颊齿中最大的，P_5不臼齿化、下跟座明显窄于下三角座，斜脊指向下后尖后侧，M_3不缩小，下颌骨具外下颌孔（labial mandibular foramen, Kielan-Jaworowska and Dashzeveg (1989) 术语）等（Kielan-Jaworowska and Dashzeveg, 1989; Sigogneau-Russell *et al.*, 1992），均与新材料有明显的区别。

Otlestes Nessov, 1985 是依据下齿列建立的，它的P_5具明显的下三角座，M_2小于M_1，斜脊指向下原脊中部等，与 V12040 相似，但它的颊齿齿式为 5·3，P_5下三角座不如 V12040 发育，下臼齿下次小尖大，不与下内尖靠近，M_3不退化，具突出的下次小尖等，均明显地区别于潜山发现的新材料。

Kennalestes Kielan-Jaworowska, 1968 与新材料之间还有如下相似之处：下三角座张开，无外下颌孔，上颊齿原尖部分宽，具前、后齿带，后齿带比前齿带宽，下颌孔位置低而靠后。它与新材料的差别也相当显著：*Kennalestes* 的齿式为 4·1·4·3/3·1·4·3，犬齿双根，上颊齿附尖明显，外中凹深，小尖较大，P^5的后尖不发育，M^2是上颊齿中最大的，P_5不臼齿化，仅有一个主尖，下臼齿向后逐渐增大，下跟座比下三角座窄，下次小尖靠近下次尖。

Palaeoryctidae 在北半球有较广泛的时空分布，从晚白垩世一直到始新世甚至中新世。目前归入 Palaeoryctidae 科的中生代成员有亚洲的 *Asioryctes* Kielan-Jaworowska, 1975、*Deccanolestes* Prasad and Sahni, 1988、*Bulaklestes* Nessov, 1985、*Daulestes* Trofimov and Nessov, 1979 和 *Oxlestes* Nessov, 1982 以及北美的 *Cimolestes* Marsh, 1892、*Procerberus* Sloan and Van Valen, 1965 和 *Batodon* Marsh, 1892。*Asioryctes* 的P^5有较明显的后尖(虽然 Kielan-Jaworowska (1975, 1981) 指出P^5缺少后尖，但在她 1981 年文章的图版 18 之 1c 和图版 19 之 1c 的右P^5照片上，可以清楚地见到有小的后尖)等与新材料一致。但 *Asioryctes* 的P^5后尖不如 V12040 发育，而且齿式为 5·1·

1) 本文比较讨论中叙述的 *Kennalestes*、*Asioryctes*、*Zalambdalestes*、*Barunlestes* *Praolestes*、palaeoryctids 和 leptictids 的 P4、P5 分别与原文中的 P3、P4 相对应。

4·3/4·1·4·3，犬齿双根，上颊齿外架宽，外中凹深，外架上附尖发育，M^2 为上颊齿中最大者，无前、后齿带，P_5 不臼齿化，仅有一个主尖，下臼齿向后不明显变小。在上述其他属中，只有 *Cimolestes* 的某些种，如 *C. incus* 和 *C. propalaeoryctes*，具有较完整的下齿列，齿式为?·1·4·3。这些中生代 Palaeoryctidae 属种的上颊齿外架宽，P^5 臼齿化程度低，后尖不发育，臼齿前、后尖棱发育，前、后尖靠近，中央棱高，原尖前后向短，M^2 是上颊齿中最大者。P_5 基本不臼齿化，下臼齿跟座明显比三角座窄，M_3 有向后突出的下次小尖，下臼齿向后逐渐增大（Clemens，1973；Lillegraven，1969；Archibald，1982；Prasad and Sahni，1988；Prasad *et al.*，1994；Nessov *et al.*，1994）。此外，*Cimolestes* 下臼齿下前棱上有明显的裂凹存在（Clemens，1973；Lillegraven，1969；Archibald，1982），而被认为与食肉目（Carnivora）的起源有关（Lillegraven，1969）。

新生代早期的 Palaeoryctidae 被归入三个亚科：Palaeoryctinae，Didelphodontinae 和 Micropternodontinae。有些作者则将它们作为 Palaeoryctoidea 超科中的三个科，如 McKenna 等(1984)。Palaeoryctinae 只发现于北美，包括古新世和始新世的 *Palaeoryctes* Matthew，1913、*Pararyctes* Van Valen，1966、*Aaptoryctes* Gingerich，1982 和 *Eoryctes* Thewissen and Gingerich，1989 等属。这些属中，保存完整齿列的都显示下颊齿齿式为 3·3，与新材料相同，而且某些属种，如 *Aaptoryctes ivyi* Gingerich，1982，下臼齿也是逐渐变小的。但是这些属种与新材料的区别也是十分显著的。这些属种上颊齿更为横宽，原尖前、后向短，外架宽，外中凹深，前、后尖棱发育，前、后尖非常靠近，连生，P_5 不臼齿化，下跟座明显窄于下三角座，下原尖显著高于下后尖，下次小尖更接近于下次尖（Matthew，1913；Van Valen，1966，1967；Gingerich，1982；Thewissen and Gingerich，1989）。

Didelphodontinae 在亚洲、欧洲和北美均有发现，它们的外架相对较窄，前、后尖较分开，少数属种下臼齿向后缩小，如欧洲的 *Aboletylestes* Russell，1964，也与新材料相似，但它们已知有完整齿列的属种表明其颊齿齿式为 4·3/4·3，前、后尖棱发育，上颊齿外侧长显著大于内侧长，P5 的臼齿化程度低，下臼齿不向后缩小或缩小不明显，下次小尖距下次尖更近（Van Valen，1966；Russell，1964；Russell and Dashzeveg，1989）。

Micropternodontinae 包括蒙古古新世 *Sarcodon* Matthew and Granger，1925[1)]，中国古新世 *Prosarcodon* McKenna et al.；1984，始新世 *Sinosinopa* Qi，1979 和美国始新世—中新世 *Micropternodus* Matthew，1903。*Prosarcodon* 的上、下齿列齿式均为 3·1·4·2，*Sarcodon* 的下齿列也只有 2 枚臼齿，与潜山的新材料不同。虽然 *Sarcodon* 和 *Prosarcodon* 上颊齿的外架窄，但它们的前、后尖棱发育，前、后尖比较靠近，原尖前后向短，有一个大的次尖架及很发育的次尖，下前尖相对较大，下原尖高于下后尖，下次小尖向后突出，离下次尖更近，下跟座明显窄于下三角座（Matthew and Granger，1925；Szalay and McKenna，1971；McKenna *et al.*，1984），与 V12040 号标本不同。亚洲的另一属 *Sinosinopa* 的上颊齿齿式为 4·3，M^2 是上颊齿中最大的，上臼齿次尖发育，下

1）将亚洲的 *Prosarcodon*、*Sarcodon* 和 *Sinosinopa* 与北美的 *Micropternodus* 归入同一个分类单元，主要依据的是它们均具有发育的次尖（Van Valen，1966；McKenna *et al.*，1984）。但它们在牙齿结构上的差别颇为显著，能否归入同一个分类单元尚有待进一步研究。

颊齿向后增大,有突出的下次小尖,下原尖高于下后尖,下三角座显著宽于下跟座(Qi, 1987)等均可视为它与潜山材料之区别。

Zalambdalestes Gregory and Simpson (1926) 是比较特化的早期原始的真兽类之一,与新材料有较多的相似特征,主要表现在:上颊齿外架窄,前、后尖基本呈锥形,前、后尖棱不发育,P^5 有弱的后尖,P_5 臼齿化,下三角座发育,下原尖与下后尖几乎相连,上、下臼齿向后变小,下次小尖比较小,距下内尖更近。但两者之间的差别仍然是很明显的。首先,两者的齿式不同,*Zalambdalestes* 的齿式为 3·1·4·3/3·1·4·3;其次,*Zalambdalestes* 上颊齿的附尖较发育,外中凹深;再有,*Zalambdalestes* 的下犬齿小,下臼齿三角座前后压缩,M_3 跟座上有三个小尖。

Barunlestes Kielan-Jaworowska (1975) 是 Zalambdalestidae 科的另一成员,它的下牙齿式为 3·1·3·3,下颌联合伸至 P_4 处 (Kielan-Jaworowska, 1975; Kielan-Jaworowska and Trofimov, 1980),与新材料相同,其他相似特征与 *Zalambdalestes* 的一致。它与新材料的区别基本上和 *Zalambdalestes* 与新材料的区别相同,只是 *Barunlestes* 的 P_5 臼齿化程度更高。

亚洲古新世的 *Praolestes* Matthew *et al.*, 1929 和 *Anchilestes* Qiu and Li, 1977 也曾被归入 Zalambdalestidae 中。*Praolestes* 最初命名时作为不确定成员被归入 Leptictidae 中 (Matthew *et al.*, 1929), Van Valen (1966, 1967) 将其归入 Geolabidinae 中,但没有相应的讨论。Szalay and McKenna (1971) 又将其归入 Zalambdalestidae 科中。Kielan-Jaworowska (1984) 则认为 *Praolestes* 的 P_4 跟座小,下臼齿三角座不明显缩小,因而不应该归入 Zalambdalestidae 中。*Praolestes* 的正型标本(也是唯一的材料)仅保存了左侧 P_4—M_1,它的 M_1 下跟座相对较宽,P_5 下三角座发育,后面一个颏孔位于 P_4 下方等特点,与潜山的新材料相似,但其 P_5 下三角座张得很开,下跟座单尖,下颊齿下三角座上的尖相对较低等都与 V12040 有一定的区别。由于受材料的限制,不能对两者进行更详细的比较。

Anchilestes 命名时即被原作者归入 Zalambdalestidae 中(邱占祥、李传夔, 1977)。后来,丁素因、郑家坚(1989)将其归入裂齿目 (Tillodontia) 中。虽然将 *Anchilestes* 归入裂齿目尚有争议,但 *Anchilestes* 的上颊齿外架宽,原尖部分窄,前、后尖侧向压扁,前、后尖棱发育,具发育的次尖架,下颊齿下三角座不明显压缩等特点,不仅可以将其排斥在 Zalambdalestidae 之外,而且也可以将它与 V12040 相区别。

Taslestes、*Zhelestes*、*Aspanlestes* 和 *Sorlestes* 是 Nessov 于 1982 和 1985 年分别依据产于前苏联中亚地区的上、下齿列或具单个牙齿的残破下颌骨建立的,均被归入 Zhelestidae 中 (Nessov *et al.*, 1994),虽然目前尚不能肯定这些属种的划分是否完全可靠,但这并不影响讨论它与本文所描述材料之间的异同。

Zhelestes 包括两个种: *Z. temirkazyk* 和 ?*Z. bezelgan*,均是根据上齿列建立的。两者之间的差别比较明显,被认为可能代表了不同的属 (Nessov *et al.*, 1994, 第 67 页)。两者与新材料上齿列的相似之处在于:外架窄,外中凹浅,除 P^5 的前附尖较发育外,外架上附尖和小尖不发育,前、后尖分开,具弱的前、后齿带。而且 *Z. temirkazyk* 的 M^1 比 M^2 大。潜山的新材料与它们之间的区别也很明显。*Z. temirkazyk* 的上颊齿齿式为 5·3,其

中 P^1 和 P^3 比较小，P^5 相对比较窄，无明显的后尖，M^2 缩小不显著，后外架未完全退化，其他特征由于 *Z. temirkazyk* 的正型标本磨蚀严重而无法比较 (Nessov *et al.*, 1994)。?*Z. bezelgan* 的描述非常简单，但从 Nessov *et al* (1994) 的图版 (图版 6，图 1) 上可以看出它在下述特征上与新材料相区别：?*Z. bezelgan* 的 P^5-M^2 不太横宽，P^5 无明显的后尖，仅为外侧尖后棱上的一个突起，P^5 前小尖与臼齿的前、后小尖发育，呈 V 形，M^2 比 M^1 大。

Aspanlestes、*Sorlestes* 和 *Taslestes* 均根据下牙命名，其中 *Aspanlestes* 的正型标本为一具 $P_{4-5}M_{1-2}$ 的右下颌骨，而后两属的正型标本均为具 M_2 的右下颌骨残段 (Nessov *et al.*, 1994)。它们与新材料的共同点在于：下前尖小，比较靠近唇侧，下次尖比较靠后，下次小尖更靠近下内尖，无下内尖棱，下跟座内侧开放。*Aspanlestes* 的 P_5 有一个略呈盆形的下跟座也与新材料一致；*Taslestes* 的下颌骨上咬肌窝深，前缘界限清楚，下跟座略窄于下三角座等特征与新材料相同。但是 *Aspanlestes* 的 P_5 下三角座不发育，下后尖小，与下原尖分开，下臼齿的下跟座宽于下三角座，M_2 比 M_1 略大或相近，不象潜山材料那样明显小于 M_1。*Sorlestes* 仅有一枚 M_2 可供比较，其下跟座上的三个尖均比较明显，且被切迹分开。*Taslestes* 的标本保存不好，连 Nessov 等(1994)亦认为不足以定义一个属级分类单元 (第 57 页)。从描述和图版上均看不出它与新材料在牙齿结构上的实质性差别，但其个体很小，M_2 的长度在线性比例上约为新材料 M_1 长度的 3/7 (因新材料的 M_2 显著变小，故用 M_1 作比较，即使与新材料的 M_2 相比，*Taslestes* 的 M_2 也只比新材料 M_2 的 1/2 略大)。

Gallolestes Lillegraven, 1976 最初被归入食虫目一未定科中，原作者认为很可能代表一新科 (Lillegraven, 1976)。1985 年，Nessov 将其归入 Mixotheridia 的一未定科中(见 Nessov *et al.*, 1994)，后来又被进一步归入 Zhelestidae 科中 (Nessov *et al.*, 1994)。该属正型标本与 V12040 的区别在于：下三角座前后压缩明显，下三角座前缘与下原脊几乎平行，齿尖呈锥形，下三角凹很浅，下跟凹较深，开口较窄，下内尖、下次小尖较发育，下内尖与下次尖的位置比较靠前。

Leptictidae 上颊齿外架窄，前、后尖棱不发育，前、后尖较分开等与新材料相近，但 ·epticitds 上、下颊齿齿式为 4·3，前臼齿臼齿化程度很高，P^4 已有较大的后尖，P_5 下跟座与下臼齿的下跟座已无区别，M^2 是上颊齿中最大的，下臼齿向后变大，具向后突出的下次小尖，且下前尖与下次小尖比较靠近唇侧 (Novacek, 1977, 1986a)。

通过上面的比较可以看出，潜山发现的新材料与上述类群虽有相似之处，但也存在着明显的不同，因此本文将其命名为一新属新种——周氏安徽兽 (*Wania chowi* gen. et sp. nov.)

三、分类位置讨论

由于受材料保存状况的限制，只有齿列特征可以用来讨论 *Wania* 的分类地位。这些特征包括颊齿齿式、犬齿大小、上颊齿外架宽度及外中凹深浅、附尖及柱尖等的发育程度、前、后尖棱的发育程度、前臼齿的臼齿化程度、下跟座宽度、下次小尖位置、臼齿的相对

大小等。Butler (1977) 与 Fox (1984) 分别列举了早期真兽类颊齿的一系列原始性状状态，Novacek (1986a) 也比较了原始真兽类的齿列特征。在本文的讨论过程中，基本上采纳了他们的观点，但在个别特征上与他们的看法有区别。

1. 颊齿齿式：在比较的类群中，只有 *Palaeoryctes* 和 *Aaptoryctes* 保存了与 *Wania* 相同的颊齿齿式，其他的要么未保存完整的前臼齿列，要么前臼齿均在4枚以上。在真兽类哺乳动物演化过程中，前臼齿数目多显然代表了更为原始的演化阶段。Novacek (1986a)就认为具5枚前臼齿代表了比具4枚前臼齿更为原始的性状状态。但由于在众多的关系不甚密切的哺乳动物类群中均有仅具3枚前臼齿的类型，如 *Deltatherium*、Tillodontia 的大多数属种、食肉类中的一些属种等，因此虽然前臼齿数目的减少代表了衍生的性状状态，但它可能多次平行发生于真兽类哺乳动物类群中。

2. 犬齿大小：在所有比较的类群中，保存了犬齿的，只有 *Zalambdalestes* 和 *Barunlestes* 的犬齿比较小，其他的均具大的犬齿。虽然没有人指出犬齿大小在早期真兽类哺乳动物中的演化趋势，但大犬齿在大多数类群中的存在，使我们有理由认为，在早期真兽类的演化历史中，相对较大的犬齿应该是近祖性状。*Wania* 具有大的犬齿，无助于解决它的分类位置问题。

3. 外架宽度、外中凹深浅以及外架上附尖、小尖的发育程度：由于这三项特征是相互关联的，因此放在一起作为一个特征组合加以讨论。在大多数原始的真兽类中，包括 *Prokennalestes*、*Kennalestes*、*Asioryctes* 以及 Palaeoryctidae 等，外架都比较宽，外中凹深，附尖、柱尖等相当发育，这种状态可被视为真兽类的近祖性状，而 *Zhelestes*、*Zalambdalestes*、*Barunlestes*、*Wania* 和 Leptictidae 在这一方面则代表了衍生的性状状态。在这一点上，各家的观点比较一致。

4. 前、后尖棱的发育程度：前、后尖棱在大多数原始的真兽类中比较发育，只有 *Wania*、*Zalambdalestes*、*Barunlestes* 和 Leptictidae 的前、后尖棱相对不太发育，可以认为它们代表的是衍生的性状状态。

5. 前臼齿的臼齿化程度：在早期真兽类中，前臼齿的臼齿化程度低无疑是代表了近祖的性状状态。在所有比较的类群中，leptictids 的前臼齿臼齿化程度最高，P^4 已有较大的后尖，P_4 也有明显的下后尖，*Zalambdalestes*、*Barunlestes* 和 *Wania* 的 P_5 下三角座很发育，而 P^5 的后尖却很小，*Aspanlestes* 和 *Prosarcodon*、*Sarcodon* 的 P_5 均有程度不高的臼齿化。Fox (1984) 指出 P_5 的下跟座具有两个小的齿尖是原始性状，但是在大多数原始的真兽类中，P_5 的下跟座均为单尖，后来发现的 *Prokennalestes* 的 P_5 下跟座亦为单尖。显然，P_5 具双尖的下跟座并不是真兽类的原始特征。

6. 下臼齿跟座的宽度：在大多数比较的早期真兽类中，下跟座均明显窄于下三角座，只有 *Taslestes*、*Sorlestes*、*Aspanlestes*、*Zalambdalestes*、*Barunlestes*、*Wania* 和 leptictids 的下臼齿跟座接近、达到或超过下三角座的宽度。

7. 下次小尖的位置：在大多数原始的真兽类中，下次小尖与下次尖和下内尖之间的距离近等，而在 *Taslestes*、*Sorlestes*、*Aspanlestes*、*Zalambdalestes*、*Barunlestes* 以及 *Wania* 中，下次小尖则相对更靠近下内尖。虽然在有袋类等后兽类群中，下次小尖与下内尖相当靠近，但真兽类群中与下内尖接近的下次小尖则更可能代表了该类群内部的衍

生性状(王元青,1993)。

8. 臼齿的相对大小：在所比较的类群中，太多数的 M^2 是上齿列中最大的，只有 *Zalambdalestes*、*Barunlestes* 和 *Wania* 的 M^1 明显大于 M^2，*Zhelestes temirkazyk* 的 M^1 也略大于 M^2。下颊齿列中，大多数类群的臼齿往后逐渐变长，M_3 通常具有一个向后突出的下次小尖。只有 *Zalambdalestes*、*Barunlestes* 和 *Wania* 下臼齿往后逐渐变小，*Zalambdalestes*、*Barunlestes* 的 M_3 下次小尖突出不显著，*Wania* M_3 的下跟座退化，不具下次小尖。考虑到 M^2 大于 M^1、下臼齿向后增大的特点在真兽类中的普遍存在，可以认为 *Zalambdalestes*、*Barunlestes* 和 *Wania* 的下臼齿向后缩小、M^2 小于 M^1 代表了衍生的性状状态。

9. 下臼齿三角座的形态：总的来说，早期真兽类的下臼齿三角座与后期的大多数类群相比是比较压缩的，但在压缩程度方面存在着差异。在比较的类群中，大多数的下三角座相对比较张开，只有 *Zalambdalestes*、*Barunlestes* 和 *Gallolestes* 的下三角座压缩明显，但 *Gallolestes* 与 *Zalambdalestes*、*Barunlestes* 不同，它的下三角座前缘几乎与下原脊平行 (Lillegraven, 1976)，与 *Protungulatum* Sloan and Van Valen, 1965 有些相似，而 *Zalambdalestes* 和 *Barunlestes* 的下三角座则呈角度很小的V形 (Kielan-Jaworowska,1984)。可以认为，在早期真兽类中，下三角座前后压缩代表的是衍生性状。*Taslestes*、*Aspanlestes* 和 *Sorlestes* 的下三角座压缩程度较弱，而 *Wania* 则无明显的压缩。

综合上述分析，可以看出 *Wania* 与 *Taslestes*、*Zhelestes*、*Aspanlestes*、*Sorlestes*、*Zalambdalestes*、*Barunlestes* 等共有较多的衍生性状，如前臼齿有一定程度的臼齿化、上、下臼齿向后变小、上颊齿前、后尖棱不发育、外架窄、外中凹浅、外架上附尖不发育、下跟座较宽、下次小尖靠近下内尖等，可能有比较近的系统发育关系。因此本文将 *Wania* 归入 Mixotheridia Nessov, 1985 中。

Mixotheridia 是 Nessov (1985) 建立的亚目级分类单元，后又于 1987 年指出了将其提升为目一级分类单元的可能性 (见 Nessov *et al.*, 1994, 第 61 页)。主要特征是：上臼齿外架窄、下前尖舌侧位、下次小尖靠近下内尖。Butler (1990) 亦认为 Mixotheridia 代表了早期有胎盘类辐射中的一个分支。虽然 Nessov 给出的 Mixotheridia 的特征要限定一个目级分类单元并不很充分，但考虑到确实存在一些为 Mixotheridia 成员共有的衍生性状，且靠近基部的类群通常代表了较高级别的分类单元，笔者认为 Mixotheridia 可以作为一个目级分类单元存在。

Mixotheridia 包括两个科：Zhelestidae 和 Zalambdalestidae。相比较而言，Zalambdalestidae 应该更为特化。*Wania* 在某些特征上与 Zhelestidae 接近，如下三角座的形态、下跟座略窄于下三角座等，而在另一些特征上又与 Zalambdalestidae 相似，如上、下臼齿向后缩小，甚至更为特化，如颊齿齿式为 3·3，M_3 退化等。但由于 *Wania* 不具备压缩的下三角座这一 Zalambdalestidae 的重要特征 (Kielan-Jaworowska, 1984)，本文将它暂时归入 Zhelestidae 科中。

Praolestes 的材料不多，保存也不太好，它与 Zalambdalestidae 之间存在明显的区别。笔者同意 Kielan-Jaworowska (1984) 的观点，不将它作为 Zalambdalestidae 的成员。虽然 *Praolestes* 的下臼齿与 Zhelestidae 有相似之处，如下跟座较宽等，但其下内尖

靠前，下跟座开口窄，且下次小尖未保存，与下内尖的关系不清。因此，目前尚不能断定它的分类位置。

前面已经提到 *Gallolestes* 的下三角座前后压缩明显，下三角座前缘与下原脊几乎平行，齿尖呈锥形，下三角凹很浅，下跟凹较深，开口较窄，下内尖、下次小尖较发育，下内尖与下次尖的位置比较靠前，这些特征与 Zhelestidae 的成员明显不同。将其归入 Zhelestidae 科中显然是不合适的，它更可能与其他原始哺乳动物关系更加密切，比如它与 *Protungulatum* 在牙齿结构上具有一些相似之处，但在磨蚀面的结构上两者之间存在明显的差别，*Protungulatum* 下臼齿三角座上的磨蚀面主要位于齿尖和下前棱、下原棱上，以磨面为主，表明它在咬合过程中剪切作用不强，以研磨作用为主，这与 *Protungulatum* 的上牙齿冠较低、齿尖锥形、棱不发育、前后齿带发育、位置较高等特点是密切相关的(Crompton and Kielan-Jaworwoska, 1978)；而 *Gallolestes* 相应的磨蚀面则主要位于下原棱的后壁上，以剪面为主，说明它在咬合过程中剪切作用占了主导地位，这可能意味着 *Gallolestes* 的上牙齿带低或不发育、棱比较发育。由于缺乏 *Gallolestes* 的上牙材料，它的确切分类位置尚不能肯定。

安徽潜山古新世的 *Wania* 与蒙古及中亚地区晚白垩世的 Mixotheridia 有较近的亲缘关系，其本身在真兽类哺乳动物的早期演化中具有相当重要的意义，限于目前的材料，本文不作详细讨论，待有更好的标本发现后再进一步探讨这一问题。

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A NEW ZHELESTID (MIXOTHERIDIA, MAMMALIA) FROM THE PALEOCENE OF QIANSHAN, ANHUI

Wang Yuanqing

(Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing 100044)

Key words Qianshan; Anhui; Paleocene; Mixotheridia

Summary

During the fieldwork in the past several years, a great number of Paleocene mammals were collected from Qianshan Basin in Anhui Province. Of all the mammalian fossils recovered in recent years, only some of a few taxa, e.g. Anagalidae and Pantodonta, have been described (Hu, 1993; Wang, 1993; Wang et al., 1992). Here described specimens, a pair of lower jaws and two fragments of one left maxilla of the same individual, were found from the lower part of Upper Member of Wanghudun Formation (Middle Paleocene) in the summer of 1993 and probably represent a mixotheridian.

In this paper, the five premolar mode for primitive eutherian dentition (see McKenna, 1975; Novacek, 1986b) is adopted during the description and comparison. P4 and P5 of *Kennalestes*, *Asioryctes*, *Zalambdalestes*, *Barunlestes*, *Praolestes*, palaeoryctids and leptictids narrated in comparison section of the present paper are respectively corresponding to P3 and P4 in original description of these genera. The measurements of teeth were made under the Wild M7A microscope by following Novacek's (1976) method.

1. Description and Comparison

Infraclass　Eutheria Gill, 1872
Order　Mixotheridia Nessov, 1985
Family　Zhelestidae Nessov, 1985
Genus　*Wania* gen. nov.

Type species *Wania chowi* gen. et sp. nov.

Diagnosis As for the type and only species.

Etymology Wan, the Chinese Phonetic transliteration of the abbreviation for Anhui Province, where the fossil locality is situated.

Distribution Middle Paleocene, Qianshan, Anhui.

Wania chowi gen. et sp. nov.

(Fig. 1, 2; Pl. I)

Holotype A pair of lower jaws (with left P_5–M_3, right M_{2-3}, the roots of left canine and P_2, and the alveoli for left P_4 and right P_4–M_1), two fragments of one left maxilla (with canine and the alveoli for P^2 and anterior root of P^4, and with P^5–M^2 respectively). All the upper and lower jaws are of the same individual. Institute of Vertebrate Paleontology and Paleoanthropology, the Chinese Academy of Sciences, specimen number: V12040.

Stratigraphical horizon and locality Lower part of Upper Member of Wanghudun Formation, Middle Paleocene, 150 m south of Huanglaowu (70023) (see Qiu *et al.*, 1977), Gujing, Qianshan County, Anhui Province.

Diagnosis Dental formula: ?•1•3(?)•2+?/?•1•3•3. Upper and lower canines enlarged; P^5–M^2 strongly elongated transversely, stylar shelf narrow; metacone on P^5 small but distinct; paracones and metacones of molars separated except at the bases, ectoflexi shallow, and paracrista and metacrista not developed; M^2 smaller than M^1, and its metastylar region reduced. P_2 small and single-rooted; P_5 pretty molarized with well-developed trigonid and bicuspid talonid; trigonids much higher than talonids; the size of molars decreasing posteriorly; M_3 greatly reduced with bicuspid talonid not elongated posteriorly.

Etymology The species is named after Dr. Minchen Chow, a well-known Chinese vertebrate paleontologist and the winner of Romer-Simpson Medal in 1993.

Description The body is small in size according to the preserved upper and lower jaws. The lower jaws are relatively robust. The symphysis is not confused and reaches the junction of P_2 and P_4. The lower border of the horizontal ramus is curved in outline. Only one mental foramen is preserved on the lower jaw of each side, and is beneath P_4. The ascending ramus of left lower jaw is incompletely preserved, the cronoid process, angular process and condyle are all broken away. The anterior border of the ascending ramus tilts backwards with a strong ridge reaching the part of the horizontal ramus under the posterior part of M_2. A deep concavity for zygomaticomandibular muscle and possibly also for profound masseter and superficial temporal muscles (reference to the description of jaw musculature of

Petrodomus tetradactylus by Coldiron, 1977) is on the labial surface of ascending ramus behind the anterior ridge. Because of no trace on lingual surface of the preserved ascending ramus and the thin cronoid process, the mandibular foramen should be lowly and posteriorly situated. The vestigial medial flange (Kielan-Jaworowska's (1981) term) extends backwards from the posterior end of the upper border of horizontal ramus.

The anterior ends of both left and right lower jaws were broken away. The left one lost the portion anterior to the canine, while the part of right one prior to the anterior alveolus of P_4 misses. Left P_5-M_3 and right M_{2-3} are preserved in good condition, and the roots of left canine and P_1, and alveoli of left P_4 and right P_4-M_1 are present on both jaws respectively. The following description is mainly based on the left lower dentition.

The incisors are not preserved. The existence of incisors in all the known early eutherian forms, and the preservation of anterior end and symphysis of the lower jaws and the lower canine suggest that the incisors should be very small in size. According to the root, the lower canine is enlarged, oval in section and compressed medio-laterally. Following a short diastema (0.68mm long) behind the canine root exists a much smaller root, which should be of P_2. Posterior to the P_2's root also exists a short diastema (0.78mm in length) followed by two alveoli for P_4, which suggest P_4 probably as large as P_5 in size. On all the preserved lower cheek teeth trigonids are much higher than talonids, and the posterior walls of trigonids are vertical.

P_5 is pretty molarized, with a well-developed trigonid. The protoconid is the largest and highest cusp on trigonid and larger than those of molars, while the paraconid is the smallest and lowest one and the metaconid is intermediate. The paraconid is situated lingually and anteriorly. It is far separated from the almost completely connate protoconid and metaconid. The trigonid is wide open with an angle between paracristid and protocristid planes at about 60 degrees. The small talonid has two discernible twined cuspules which form a lingually shifted basin. Precingulid is leading upwards lingually and extends to the labial side of paraconid.

M_1 is the largest of the molars. The trigonid is more compressed anteroposteriorly than that of P_5, but still quite open with an angle at about 45 degrees between the planes of paracristid and protocristid. The metaconid is subequal to protoconid in size. The paraconid is still small. The paraconid and metaconid are separated from protoconid by deep notches respectively on paracristid and protocristid. The talonid is a wide open and lingually shifted basin with a relatively large hypoconid and two tiny cuspules, entoconid and hypoconulid which are close to each other. All three cusps on talonid are not distinctly divided. The hypoconid is located posteriorly and at the same transverse line as entoconid which is at the posterolingual corner of talonid without entocristid. The hypoconulid is little posteriorly situated to the transverse hypoconid-entoconid line. Precingulid is strong and limited in front of protoconid. The length and width of talonid are subequal to those of trigonid. The crista obliqua is low and reaches the posterior base of trigonid little labially to the midline of the tooth.

M_2 is identical to M_1 in crown pattern except for having smaller size and rela-

tively narrower talonid.

M_3 is greatly reduced, and much smaller than M_2. The paracristid is less developed, and the trigonid opens anteriorly. The talonid is shorter than trigonid, and has only two twined cuspules which are considered to be hypoconid and entoconid. The talonid is not basined because of the lost of crista obliqua.

The anterior part of left maxilla, broken away from the posterior fragment, is preserved with an enlarged canine. The distance from the lingual side of the canine to the midline of palatal is about 2.50mm. Closely behind the canine is a small alveolus which is for the first postcanine tooth, probably single-rooted P^2. Behind this is a larger one, presuming for the anterior root of P^4.

Left P^5-M^2 are only preserved upper cheek teeth. There are distinct embrasures between the neighboring two of them. P^5 is three-rooted, semimolariform and transversely elongated with a large paracone, a small but distinct metacone and a well-developed protocone. Parastylar shelf is relatively well-developed with a hardly discernible parastyle on its corner, while the metastylar shelf is almost lost. The paracone is the largest cusp of P^5 and towers above the cusps of the other two preserved cheek teeth. It is located centrally on the labial side. A faintly developed paracrista exists and does not connect with parastyle. The metacone, the smallest one, is about one-third height of paracone and lies at the posterolabial corner and separated from the paracone by a deep notch. No trace of metacrista could be seen on the crown. The protocone is lower than those of molars and quite separated from the paracone and metacone. The paraconule is a discernible small cuspule on the anterior edge close to the midline of the tooth. Preparaconular crista is low and reaches the parastyle, and the postparaconular crista is absent. The preprotocrista extends from protocone to paraconule with a notch at the lingual base of the latter, whereas the postprotocrista directly extends to posterolabial corner because of no metaconule. Ectocingulum extends along the external edge from the anterior corner to the posterior one, while the entocingulum does not exist on lingual side. The precingulum is absent, and the short postcingulum is only present posterior to the protocone.

M^1, larger than P^5 and M^2, is the largest upper cheek teeth and also transversely elongated. On the labial side stand two conical cusps: a larger and higher paracone and a little smaller and lower metacone. They are distinctly separated and only connate at their bases. Both the paracrista and metacrista are absent. The stylar shelf is narrow and with a very shallow ectoflexus; the parastylar and metastylar regions are equally developed without distinct styles and other cuspules. The protocone is V-shaped and slightly lower than paracone and metacone. The preprotocrista and postprotocrista extend to paraconule and metaconule respectively. Both the paraconule and metaconule look like the inflations on protocristae, and the former is more distinct and larger than the latter. The preparaconular and postmetaconular cristae extend to the anterolabial and posterolabial corners respectively and meet the ectocingulum there. The precingulum is narrow but distinct at the lingual part of anterior edge. The postcingulum is better-developed and wider than precingulum. It looks like a hypocone shelf without an obvious hypocone.

M^2 is smaller (shorter and narrower) than M^1 and is similar to the latter in

crown structure. Its metacone is smaller relative to the paracone. The stylar shelf is narrower than that of M^1, and the metastylar region is reduced and less labially projected than parastylar region. The paraconule is distinct (although small) and the metaconule is nearly not discernible. Unlike M^1, the postmetaconular crista does not extend to the posterolabial corner and does not meet ectocingulum. The precingulum and postcingulum are less developed than those of M^1.

On all the preserved upper cheek teeth, the lingual walls of protocones are not vertical and tilt labially, and the postprotocristae are lower than the corresponding preprotocristae.

Comparison Here described specimens (V12040) possess some primitive characters including transversely elongated upper cheek teeth, weak conules, medial flange, small paraconid and much higher trigonid relative to talonid, etc. These characters make V12040 similar to the early primitive eutherian mammals, such as Otlestidae Nessov, 1985, *Kennalestes* Kielan-Jaworowska, 1968, Palaeoryctidae Simpson, 1931, Zhelestidae Nessov, 1985, Zalambdalestidae Gregory and Simpson, 1926 and Leptictidae McKenna, 1975.

According to the current classification, otlestids fall into two genera: i. e. *Prokennalestes* Kielan Jaworowska and Dashzeveg, 1989 and *Otlestes* Nessov, 1985. *Prokennalestes* was considered to be the oldest and most primitive eutherian (Kielan-Jaworowska and Dashzeveg, 1989). It differs from the new material of Qianshan in having five premolars, no obvious metacone on P^5, wide stylar shelf with well-developed styles, stylocone and cuspules, deep ectoflexus, no pre-and postcingulum, nonmolarized P_5 talonid distinctly narrower than trigonid, oblique crest extending up to the posterior surface of metaconid, hypoconulid not close to entoconid, M_3 not reduced (Kielan-Jaworowska and Dashzeveg, 1989; Sigogneau-Russell *et al.*, 1992).

Otlestes distinguishes from *Wania* in having five premolars, less developed trigonid of P_5, relatively larger hypoconulid less close to entoconid, M_3 not reduced and with hypoconulid projecting posteriorly.

Kennalestes Kielan-Jaworowska, 1968 resembles V12040 in following aspects: trigonid wide open, protocone portion wide, pre- and postcingulum. It differs from the latter in dental formula of cheek teeth (4 • 3) with double-rooted canine, wide stylar shelf with obvious styles, deep ectoflexus, winged conules, less developed metacone on P^5,M^2 being the largest among the upper cheek teeth, P_5 nonmolariform and only one main cusp, lower molars increasing posteriorward in size, talonid distinctly narrower than trigonid, etc. (Kielan-Jaworowska, 1968, 1981).

Palaeoryctidae has a relatively wide Holarctic distribution and occurs from Late Cretaceous through Eocene to Miocene.

Mesozoic palaeoryctids include *Asioryctes* Kielan-Jaworowska (1975), *Deccanolestes* Prasad and Sahni (1988), *Bulaklestes* Nessov (1985), *Daulestes* Trofimov and Nessov (1979) and *Oxlestes* Nessov (1982) of Asia and *Cimolestes* Marsh (1892), *Procerberus* Sloan and Van Valen (1965) and *Batodon* Marsh (1892) of North America according to the current classification. *Asioryctes*, similar to V12040, has a distinct but small metacone on P^5, which can be clearly seen in the photographs of P^5 in Kielan-Jaworowska's paper (1981, Pl. 18, 1c and Pl. 19, 1c), although

Kielan-Jaworowska (1975, 1981) considered no metacone on P^5 in her description of *Asioryctes*. Obviously differing from V12040, *Asioryctes* has double-rooted canine, four upper and lower premolars, wide stylar shelf with well-developed styles and deep ectoflexus, M^2 largest among the upper cheek teeth, no pre- and postcingulum, nonmolarized P_5 with only one main cups, molar talonid distinctly narrower than trigonid, well-developed hypoconulid equidistant from both hypoconid and entoconid, and molars not decreasing posteriorly in size, etc.

The other Mesozoic palaeoryctids have almost the same differences from V12040 as *Asioryctes* (Clemens, 1973; Lillegraven, 1969; Archibald, 1982; Prasad and Sahni, 1988; Prasad *et al.*, 1994; Nessov *et al.*, 1994). And *Cimolestes* has an obvious carnasial notch on paracristid between paraconid and protoconid (Clemens, 1973; Lillegraven, 1969: Archibald, 1982), so that it was considered as possible ancestor of Carnivora (Lillegraven, 1969), which was not accepted by Fox and Youzwyshyn (1994).

Cenozoic palaeoryctids fall into three subfamilies: Palaeoryctinae, Didelphodotinae and Micropternodon tinae. Some authors, such as McKenna *et al.* (1984) and Qi (1987), considered them as three families of the superfamily Palaeoryctoidea. Palaeoryctinae, including *Palaeoryctes* Matthew (1913), *Pararyctes* Van Valen (1966), *Aaptoryctes* Gingerich (1982) and *Eoryctes* Thewissen and Gingerich (1989), is so far only reported from Paleocene and Eocene of North America. Among the above listed genera, like V12040, the dental formula of cheek teeth is 3 • 3 if preserved. And similar to the new specimens of Qianshan, the lower molars are reduced posteriorly in *Aaptoryctes ivyi* Gingerich (1982). All palaeoryctines are rather different from V12040 in having wide stylar shelf and deep ectoflexus, well-developed para- and metacristae, paracone and metacone very close to each other and almost completely connate, P_5 nonmolariform, talonid obviously narrower than trigonid, protoconid distinctly higher than metaconid, and hypoconulid not close to entoconid, etc. (Matthew, 1913; Van Valen, 1966, 1967; Gingerich, 1982; Thewissen and Gingerich, 1989).

In didelphodontines, there are some characters similar to V12040, such as relatively narrow stylar shelf, separate paracone and metacone, and even lower molars decreased posteriorly in size in some forms (e.g. European *Aboletylestes* Russell, 1964). But the following features, dental formula of cheek teeth (4•3), well-developed para-and metacristae, upper cheek teeth not so elongated transversely, less molarized P_5, lower molars not greatly reduced or even increasing posteriorly in size, and hypoconulid not close to entoconid, etc. (Van Valen, 1966; Russell, 1964; Russell and Dashzeveg, 1989), make didelphodontines distinctly differ from V12040.

Asian *Sarcodon* Matthew and Granger (1925), *Prosarcodon* McKenna *et al.* (1984) and *Sinosinopa* Qi (1979) are referred to Micropternodontinae together with North American *Micropternodus* Matthew (1903) (Van Valen, 1966, 1967; McKenna *et al.*, 1984; Qi, 1987). Such classification was first suggested by Van Valen in 1966 mainly based on the general configuration of metacrista and hypocone region, although he agreed that the special similarities of *Micropternodus* to *Sarcodon* must be convergent (Van Valen, 1966, p. 61). It should be pointed out that most of the similarities between *Micropternodus* and *Sarcodon* listed by Van Valen (1966) are

probably of primitive characters, and that the relationships of *Micropternodus* and Asian "micropternodontines" are far from any certainty, and need further discussion. *Sarcodon* has a twin-cuspid talonid on P_5, like that of V12040, as figured by Szalay and McKenna (1971), but it only has two lower molars. Both *Prosarcodon*, with four premolars and two molars, and *Sarcodon* differ from V12040 in having well developed para- and metacristae, paracone and metacone close to each other, wide hypocone shelf with well-developed hypocone, relatively large paraconid, protoconid obviously higher than metaconid, hypoconulid projecting posteriorly and not close to entoconid, and talonid obviously narrower than trigonid (Matthew and Granger, 1925; Szalay and McKenna, 1971; McKenna *et al.*, 1984). Another Asian genus, *Sinosinopa*, distinguishes from V12040 in having four upper premolars and three molars, M^2 largest among the upper cheek teeth, well-developed hypocone, lower molars increasing in size posteriorly, hypoconulid projecting posteriorly, protoconid distinctly higher than metaconid, trigonid obviously wider than talonid (Qi, 1987). North American *Micropternodus* is rather specialized in morphology (McKenna *et al.*, 1984) and quite different from V12040, and does not invite a comparison with the latter.

Zalambdalestes Gregory and Simpson (1926) is one of the comparatively specialized early primitive eutherian, and has a number of similarities to new specimens of Qianshan as follows: narrow stylar shelf, conical paracone and metacone, paracrista and metacrista not well-developed, small metacone on P^5,P_5 molarized with well-developed trigonid and almost connate protoconid and metaconid, upper and lower molars decreasing posteriorly in size, hypoconulid small and close to entoconid. But *Zalambdalestes* is still quite different from V12040 in following aspects: dental formula (3•1•4•3), more developed styles and deep ectoflexus, lower canine small, trigonid compressed anteroposteriorly, and talonid of M_3 with three obvious cuspules. Another genus of Zalambdalestidae, *Barunlestes*, has the same dental formula of cheek teeth as that of V12040, and its symphysis extends backwards to P_4 also similar to V12040. The other similarities between them are identical to those between *Zalambdalestes* and V12040. *Barunlestes* differs V12040 basically in the same aspects as those of *Zalambdalestes*, only P_5 more molarized.

Praolestes Matthew *et al.*, 1929 from the Paleocene of Mongolian People's Republic has been referred to Zalambdalestidae by Szalay and McKenna (1971), which was not accepted by Kielan-Jaworowska (1984) because of its small talonid of P_5 and uncompressed trigonid of M_1. The holotype, also unique specimen, of *Praolestes* only has P_4-M_1 preserved. It has some resemblance to V12040 as follows: talonid of M_1 relatively wide, trigonid of P_5 well-developed and posterior mental foramen beneath P_4, but it obviously differs from V12040 in having wider open trigonid on P_5 with one cuspid talonid and relatively lower cusps on trigonids. The detailed comparison of *Praolestes* and V12040 cannot be made at present because the specimen of *Praolestes* is not good enough.

Taslestes, *Zhelestes*, *Aspanlestes* and *Sorlestes* were suggested by Nessov in 1982 and 1985 respectively, based on some upper or lower dentitions or fragmentary lower jaws from Middle Asia (Uzbekistan, Kazakhstan and Tajikistan) and were all referred to Zhelestidae (Nessov *et al.*, 1994). *Zhelestes* Nessov, 1985 includes

two species: *Z. temirkazyk* and? *Z. bezelgan*, both are based on upper dentitions. They differ from each other obviously, and were considered to possibly represent different forms at the genus level (Nessov *et al.*, 1994, p. 67). Both are similar to V12040 in following aspects: narrow stylar shelf, shallow ectoflexus, less developed styles and cuspules on stylar shelf except for P^5, separate paracone and metacone, weak precingulum and postcingulum, and even M^1 larger than M^2 in *Z. temirkazyk*. But unlike V12040, *Z. temirkazyk* has five upper premolars, P^5 not so elongated transversely and without distinct metacone, M^2 not obviously smaller than M^1 and its metastylar region not completely reduced. The other characters could not be detailed compared with each other for the great worn of the type specimen of *Z. temirkazyk*. The description of ? *Z. bezelgan* provided by Nessov is very brief, but its distinction from V12040 can be seen on Figure 1 of Plate 6 in the paper of Nessov *et al.* (1994). It shows dissimilarities to V12040 as follows: upper cheek teeth distinctly less elongated transversely, no obvious metacone on P^5, paraconule on P^5 and paraconule and metaconule on molars well-developed and V-shaped, M^2 larger than M^1.

Aspanlestes, *Sorlestes* and *Taslestes* are all set up based on lower jaws. Among them, the holotype of *Aspanlestes* is a right lower jaw with $P_{4-5}M_{1-2}$, while the holotype of the other two genera is a right lower jaw fragment with M_2 (Nessov *et al.*, 1994). They have following similarities to V12040: small paraconid displaced lingually, hypoconid shifted posteriorly, hypoconulid close to entoconid, no entocrista, and talonid wide open lingually, etc. And like V12040, P_5 of *Aspanlestes* has a small weakly basined talonid and a deep cavity for masseter muscles is present on the labial side of lower jaw of *Taslestes*. *Aspanlestes* differs from V12040 in the following aspects: trigonid of P_5 less developed with a small metaconid separated from protoconid, talonids of lower molars wider than trigonids, M_2 subequal to or slightly larger than M_1. Only M_2 of *Sorlestes* can be compared with here described specimen. Its talonid has three distinct cusps separated by notches. The specimen of *Taslestes* is not good enough to define a new taxon at the genus level (Nessov *et al.*, 1994, P. 57). *Taslestes* is rather small in body size. Its M_2 is only three-sevenths long of M_1 of V12040 (because of the reduction of M_2 of the latter, comparison was made with M_1, even if compared with M_2 of the latter, it is only slightly longer than the half length of V12040's M_2).

Gallolestes Lillegraven (1976) was classified in an undetermined family of Insectivora and considered to probably represent a new family by the original author (Lillegraven, 1976). In 1985, Nessov put it in an indeterminate family of his new suborder Mixotheridia together with *Aspanlestes*, *Sorlestes* and *Taslestes* (see Nessov *et al.*, 1994). Later, it was further referred into Zhelestidae (Nessov *et al.*, 1994). The following characters of its holotype make it distinguishable from V12040: trigonid compressed anteroposteriorly with conical cusps and its anterior margin nearly parallel to protocristid, trigonid basin shallow, talonid narrowly open, entoconid and hypoconulid well-developed, hypoconid and entoconid comparatively forward positioned.

Leptictidae resembles V12040 in having narrow stylar shelf, less developed paracrista and metacrista, separate paracone and metacone, etc. The dental formula of

lepticitid cheek teeth (4·3), highly molarized premolars (P^4 already with an obvious metacone and the trigonid of P_5 not distinct from that of a molar), M^2 largest among the upper cheek teeth, and lower molars increasing posteriorly in size with hypoconulid jutting backwards and displaced labially (Novacek, 1977, 1986a) distinguish leptictids from V12040.

The above comparisons clearly suggest that the new specimens of Qianshan (V12040) should be considered as a representative of a new eutherian form. And here it is named *Wania chowi* gen. et sp. nov.

2. Discussion about the taxonomic position of *Wania*

Because of the poor preservation of the specimens of *Wania chowi* gen. et sp. nov., only the dental characters could be used in discussion about its taxonomic position, which include dental formula of cheek teeth, size of canines, width of stylar shelf, depth of ectoflexus, development of styles and stylocone, molarization of premolars, development of paracrista and metacrista, width of talonid, position of hypoconulid, relative size among molars, etc. Butler (1977) listed some features regarded as primitive pattern of Eutheria when comparing the molars of *Kennalestes* and *Cimolestes*. Subsequently, Fox (1984) gave an extensive list of hypothetical character states of early eutherians, and Novacek (1986a) compared the dental features of primitive eutherians as well. Their opinion is basically adopted in discussion, except for the divergence in one or two characters.

1. Dental formula of cheek teeth: Among the compared taxa, only *Barunlestes*, *Palaeoryctes* and *Aaptoryctes* possess the same cheek teeth formula as *Wania*. All the others have four or more premolars if preserved. In the evolutionary history of eutherian mammals, the forms with more premolars obviously represent a more primitive stage, which is widely accepted. But because of the existence of three premolars in many groups not closely related, the reduction of the number of premolars could be considered as the result of parallelism within Eutheria.

2. Size of canines: Only *Zalambdalestes* and *Barunlestes*, of the compared groups with canines preserved, have small canines, while the others possess relatively large canines. Although no body has pointed out the evolutionary trend of canine size in eutherian history, the widespread existence of relatively large canines in many eutherian groups make it reasonable to presume that large canine should be plesiomorphous. *Wania* has relatively large canines.

3. Width of stylar shelf, depth of ectoflexus and development of styles and stylocone: Because these three characters are interrelated, they are discussed as a character assemblage. Most of primitive eutherians, including *Prokennalestes*, *Otlestes*, *Kennalestes*, *Asioryctes* and Palaeoryctidae, etc., have wide stylar shelf, deep ectoflexus and well developed styles and stylocone, that could be regarded as primitive state. In contrast, *Zhelestes*, *Zalambdalestes*, *Barunlestes*, *Wania* and Leptictidae represent derived state. About this, no distinctly divergent views are present within the students.

4. Development of paracrista and metacrista: Well developed paracrista and metacrista extensively distribute within most of primitive eutherians, except *Zhelestes*, *Zalambdalestes*, *Barunlestes*, *Wania* and Leptictidae. Therefore, less developed para-

crista and metacrista represent derived state of this character.

5. Molarization of premolars: In early eutherians, less molarized premolars are nearly undoubtedly of primitive character state. Among the compared groups, the premolars of leptictids are highly molarized. Its P^4 has a relatively large metacone, while the metaconid on its P_4 is distinct. The talonids on P_5 of ***Zalambdalestes***, ***Barunlestes*** and ***Wania*** are well-developed, but the metacones on their P^5 rather small. Fox (1984) considered incompletely basined talonid bearing two cusps of ultimate lower premolar as primitive state. But the unicuspid talonid on P_5 is common in most of primitive eutherians, and ***Prokennalestes***, the most primitive eutherian (Kielan-Jaworowska and Dashzeveg, 1989), has an unicuspid talonid on P_5 as well. Obviously, P_5 with a two cuspid talonid is not a primitive character in contrast to Fox's (1984) view.

6. Width of molar talonid: In most of the compared early eutherian groups, molar talonid is obviously narrower than trigonid. Only the width of the molars talonids of ***Taslestes***, ***Sorlestes***, ***Aspanlestes***, ***Zalambdalestes***, ***Barunlestes***, ***Wania*** and leptictids is subequal to or even beyond that of their trigonids.

7. Position of hypoconulid: In most of primitive eutherians, hypoconulid is equidistant from hypoconid and entoconid, while it is close to entoconid in ***Taslestes***, ***Sorlestes***, ***Aspanlestes***, ***Zalambdalestes***, ***Barunlestes*** and ***Wania***. Although the hypoconulid and entoconid are very close to each other in Marsupialia, the hypoconulid close to entoconid of some eutherian groups is more likely to be a derived character within eutherian mammals.

8. Relative size among molars: Among the compared eutherian groups, M^2 is the largest upper cheek teeth, except ***Zalambdalestes***, ***Barunlestes*** and ***Wania*** with M^1 obviously larger than M^2. M^1 of ***Zhelestes temirkazyk*** is also slightly larger than M^2. Moreover, lower molars of most groups become larger backwards and a hypoconulid jutting posteriorly is present on the talonid of M_3, while the lower molars ars reduced posteriorly in size. The hypoconulids of M_3's talonids of ***Zalambdalestes*** and ***Barunlestes*** do not distinctly project backwards, and even the talonid of M_3 of ***Wania*** is reduced with only two cusps. Considering the wide distribution of lower molars increasing posteriorly in size and M^2 larger than M^1, one could regard the reduction in size of lower molars and M^2 smaller than M^1 of ***Zalambdalestes***, ***Barunlestes*** and ***Wania*** as derived character state.

9. Trigonid of lower molars: Generally, the trigonids of early eutherian lower molars are not quite wide open. Among most of the compared forms occur relatively wide opened trigonids, while the molar trigonids of ***Zalambdalestes***, ***Barunlestes*** and ***Gallolestes*** are strongly compressed anteroposteriorly. Similar to ***Protungulatum*** Sloan and Van Valen (1965), the anterior margin of molar trigonid of ***Gallolestes*** is nearly parallel to the protocristid, whereas the molar trigonid of ***Zalambdalestes*** and ***Barunlestes*** is V-shaped at a very small angle (Kielan-Jaworowska, 1984; Crompton and Kielan-Jaworowska, 1978). The trigonids of ***Taslestes***, ***Aspanlestes*** and ***Sorlestes*** are some what compressed anteroposteriorly, while those of ***Wania*** not obviously compressed.

The above discussions show that ***Wania*** shares a number of derived characters with both zhelestids other than ***Gallolestes*** and zalambdalestids, such as more or

less molarized ultimate premolar, reduction backwards in size of both upper and lower molars, less developed paracrista and metacrista, narrow stylar shelf, shallow ectofiexus, less developed styles and stylocone, relatively wide talonid, hypoconulid and entoconid close to each other, etc. All these suggest that they may be closely related. And *Wania* is classified into Mixotheridia Nessov (1985) in the present paper.

Mixotheridia was originally put out as a suborder by Nessov in 1985 and suggested the possibility of being elevated to an ordinal rank (see Nessov *et al.*, 1994, p. 61). The diagnostic characters of Mixotheridia are as follows: stylar shelf narrow, paraconid displaced lingually and hypoconulid close to entoconid. Butler (1990) also supported that the Mixotheridia represents a branch in early placental radiation. The diagnostic characters of Mixotheridia given by Nessov are not sufficient to define an ordinal taxon, but considering the existence of some derived characters shared by the mixotheridians and the fact that the basal group usually occupy a higher level position, the author provisionally consider Mixotheridia as a taxon of ordinal rank in this paper.

Two families are included in Mixotheridia: Zhelestidae Nessov (1985) and Zalambdalestidae Gregory and Simpson (1926). Comparatively, the latter is more specialized morphologically. *Wania* is similar to zhelestids in some characters, such as trigonid pattern of lower molars, width of talonids, etc. It also resembles zalambdalestids in other characters, such as the reduction posteriorly in size of the molars. Meanwhile, it is more specialized than both zhelestids and zalambdalestids in the following characters: dental formula of cheek teeth (3 • 3), reduction of M_3. Because it does not possess compressed trigonids, the diagnostic character of Zalambdalestidae (Kielan-Jaworowska, 1984), *Wania* is provisionally referred into Zhelestidae Nessov (1985) at present.

Praolestes is distinctly different from the zalambdalestids and was excluded from Zalambdalestidae by Kielan-Jaworowska (1984) which is favored in present paper. Its taxonomic position still retains uncertain, because of its poor specimen.

As mentioned above, *Gallolestes* has the following characters: obviously compressed trigonid, anterior margin of trigonid nearly parallel to protocristid, trigonid cusps low and obtuse, trigonid basin very shallow, talonid narrowly opened, entoconid and hypoconulid well-developed, and hypoconid displaced forwards, etc., which indicate that it is distinctly different from zhelestids and that it is not suitable to classify it into Zhelestidae. Maybe it is more closely related to other primitive eutherian. *Gallolestes* has some similarities to *Protungulatum* in molar structure, but is obviously different from the latter in the structure of wear facets. The wear facets on trigonid of *Protungulatum* are mainly on the cusps and cristae, that matches its upper molars with the following features: brachiodont, conical cusps, less developed cristae, precingulum and postcingulum well-developed and high positioned (Crompton and Kielan-Jaworowska, 1978). While the corresponding wear facets of *Gallolestes* are principally on the posterior wall of trigonids, which suggests together with its high trigonid that its upper molars are hypsodont with low or less developed cingula and well developed cristae. The material of upper dentition is required to determine the taxonomic position of *Gallolestes* with certainty.

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图版 I 说明 (Explanation of Plate I)

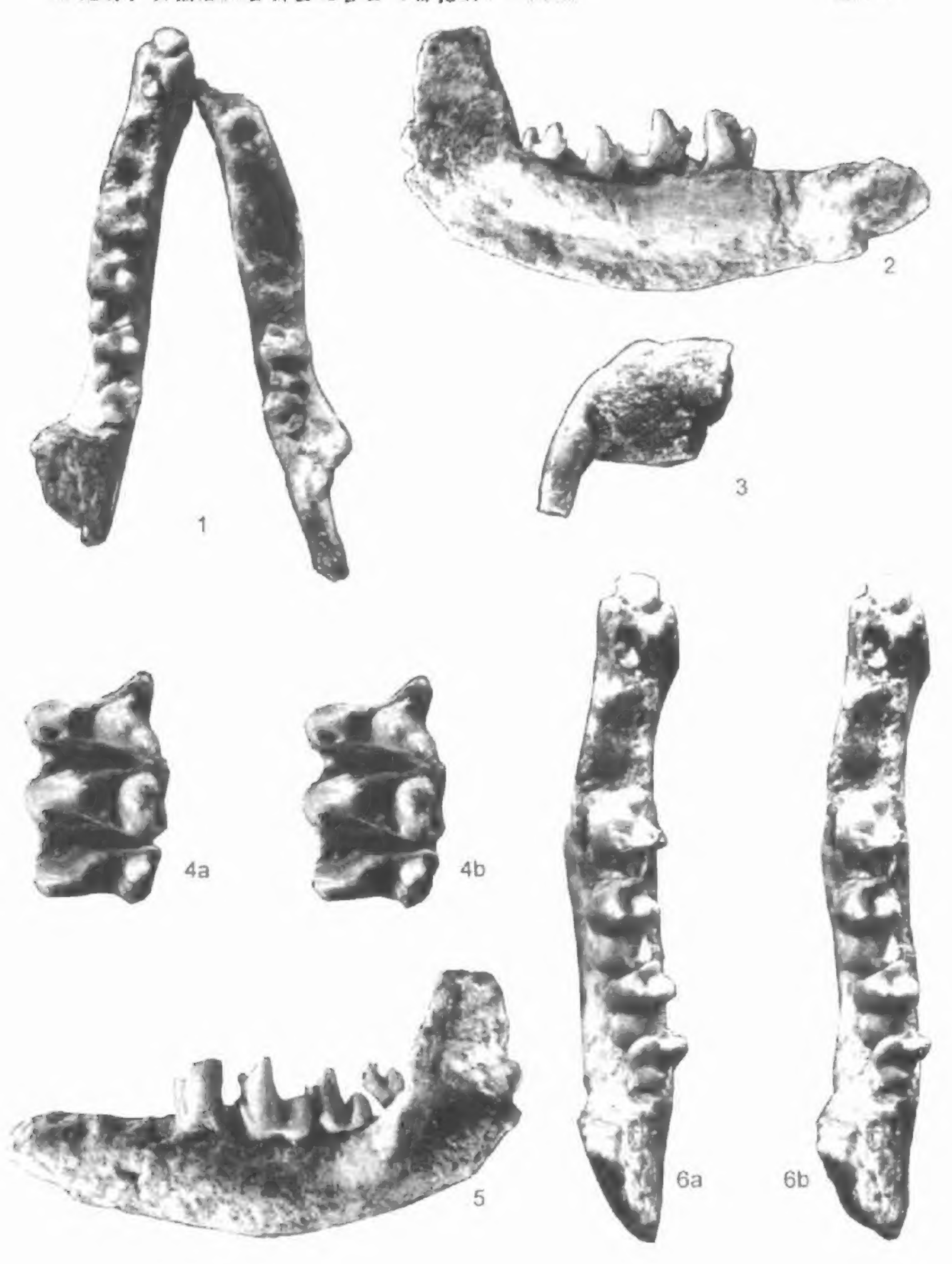
周氏安徽兽(新属、新种) *Wania chowi* gen. et sp. nov. (V12040)

1.下颌骨一对 (a pair of lower jaws), 背视 (dorsal view), X4;

2,5,6.左下颌骨具 P_5-M_3 (left lower jaw with P_5-M_3), 2.舌侧视 (lingual view), X4; 5.唇侧视 (labial view), X4; 6.背视(立体照片) (stereo-photograph of dorsal view), X5;

3.左上颌骨前段具犬齿 (anterior fragment of left maxilla with canine), 唇侧视 (labial view), X4;

4.左上颌骨残段具 P^5-M^2 (fragment of left maxilla with P^5-M^2), 冠面视(立体照片)(stereophotograph of crown view), X5


1
2
3
4a
4b
5
6a
6b